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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/640,928	08/17/2000	Morimichi Nishigaki	OAC-004	3276

959 7590 11/28/2003

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EXAMINER	
PATEL, SHEFALI D	

ART UNIT	PAPER NUMBER
2621	

DATE MAILED: 11/28/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	09/640,928	NISHIGAKI ET AL.	
	Examiner	Art Unit	
	Shefali D Patel	2621	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-18 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-18 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

13)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

a) ☐ The translation of the foreign language provisional application has been received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____.
4) ☐ Interview Summary (PTO-413) Paper No(s). _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Response to Amendment

1. The amendment was received on September 05, 2003 and has been entered.

2. Amendments to the specification have been entered.

3. Applicants' have amended claim 9 to overcome the 35 USC 112 2nd paragraph rejection and it has been withdrawn.

Response to Arguments

1. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Claim Objections

2. Claim 14 is objected to because of the following informalities: claim 14 lines 6-7 repeat the phrase "a relative speed". Please remove once occurrence of "a relative speed." Appropriate correction is required.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 11-13, and 15-16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Onishi et al. (hereinafter, "Onishi") (USPN 6,041,274) in view of Yamaguchi et al. (hereinafter, "Yamaguchi") (USPN 6,487,303).

With regards to **claim 1**, Onishi discloses an object recognition system mounted on a vehicle (Fig. 1), comprising: one or more sensors for capturing an image of an object (pick-up sensor 4, col. 8 line 38); measuring means for dividing the image into a plurality of windows and measuring a distance to the (road) surface for each of a plurality of windows (dividing the surface image into plurality of frames 12, 13 at col. 8 lines 42-47); means for storing (a storing section 7, col. 8 line 39), for each of the plurality of the windows, estimated distance to the road surface (col. 9 lines 1-11); means for comparing (Step S16, Fig. 9); for each of the plurality of the windows, the measured distance with the estimated distance to determine if the measured distance belongs to the (road) surface (comparing the "on-pause position" and "the reference position" at col. 13 lines 30-48); estimating a relative inclination of the (road) surface against the vehicle based on the measured distances that are determined to be of the (road) surface (the relative inclination (i.e., deviation) at col. 19 lines 62 to col. 20 lines 1-6 and also see, col. 10 lines 54-62); and means for modifying the estimated distances based on the inclination estimated by said inclination estimation means (modifying (i.e., correcting) distances at col. 9 lines 12-20). Onishi does not expressly disclose the surface being the road surface. Yamaguchi discloses imaging a road surface at col. 4 lines 31-35. Onishi and Yamaguchi are combinable because they are from the same field of endeavor, i.e., image processing of a surface thru a moving vehicle. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Yamaguchi with Onishi. The motivation for doing so is that Onishi suggests at col. 10 lines 54-68 that his invention may be used for another type of floor, which can specify the position, and inclination of an image pickup area with respect to the floor

surface. Therefore, it would have been obvious to combine Yamaguchi with Onishi to obtain the invention as specified in claim 1.

Claim 11 recites identical features as claim 1 except claim 11 is a method claim. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 11.

Claim 15 recites identical features as claim 1. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 15.

With regards to **claim 12**, Yamaguchi discloses extracting windows having captured the road surface from the plurality of windows, and wherein the step of inclination estimation estimates the inclination utilizing distances of the plurality of distances, the utilized distances corresponding to the extracted windows. The distance is obtained at column 8 lines 20-24 and the widows capturing the road surface are shown in Figs. 3(a) and 3(b).

With regards to **claim 13**, Yamaguchi discloses estimating distances to the road surface respectively for the plurality of windows based on the estimated inclination at, wherein windows are extracted based on the estimated distances in the step of extraction at column 6 lines 1-8.

Claim 16 recites identical features as claim 12. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 16.

5. Claims 2-10, 14, and 17-18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Onishi in view of Yamaguchi as applied to claims 1, 11-13, and 150-16 above, and further in view of Shimoura et al. (hereinafter, "Shimoura") (USPN 5,638,116).

With regards to **claim 8**, the recited features are the same as those in claim 1, and the arguments in paragraph 3 above as to the relevance of Onishi and Yamaguchi are incorporated herein. An additional feature of correcting positioning error of said one or more sensors based

on an average of the estimated inclination is discloses by Onishi at col. 9 lines 14-20 and col. 10 lines 3-10 (where the rotational angle being the inclination estimation) and by Shimoura at column 26 lines 43-48. Onishi and Yamaguchi / Onishi, Yamaguchi and Shimoura are combinable because they are from the same field of endeavor, i.e., image processing of a surface thru a moving vehicle. At the time of the invention, it would have been obvious to a person of ordinary skill in the art to combine the teaching of Yamaguchi with Onishi. The motivation for doing so is that to correct the occurred position error to eliminate problems so that the system can take images properly. Therefore, it would have been obvious to combine Yamaguchi with Onishi to obtain the invention as specified in claim 8.

With regards to **claim 2**, Yamaguchi discloses a system where inclination is estimated. However, Yamaguchi does not expressly disclose inclination estimation comprising: pitch estimating means for estimating slope of pitching of the vehicle as it travels and roll estimating means for estimating slope of roll of the vehicle as it travels. Shimoura discloses object recognition apparatus and a method in which Shimoura teaches estimating means for estimating slope of pitching of the vehicle as it travels and roll estimating means for estimating slope of roll of the vehicle as it travels at column 27 lines 34-48. One of ordinary skill in the art would have been motivated to estimate the inclination of the road surface comprising estimating slope of pitching/roll of the vehicle in order to obtain high efficiency recognition of the object, especially, (as suggested by Shimoura) since the object moves in an image from moment to moment, it requires accurate camera/sensor attitude parameters (i.e., pitch angel and roll angle) representing the attitude of the camera/sensor with respect to the road surface.

With regard to **claim 3**, Yamaguchi discloses estimating means for estimating the distance as described in claim 1 above. Yamaguchi does not expressly disclose a distance memory for storing each of the distance estimated. Shimoura discloses a memory 17 as discloses in Fig. 1. At the time the invention was made, it would have been obvious to a person of ordinary skill in the art to have the memory unit for storage purpose and using the storage data for later use.

With regards to **claim 4**, Yamaguchi discloses judging means for comparing the distance measured by said measuring means for each window and the estimated distance estimated by said distance estimating means to determine relative to each window whether the window represents the road surface (See, column 4 lines 61-67); and recognition means for recognizing the object based on a result from the judging means (See, column 8 lines 13-19).

Regarding **claim 5**, Yamaguchi discloses judging means which extracts windows that represent object other than the road surface for transfer to said recognition means at column 8 lines 17-20. Yamaguchi identifies whether the object is a road surface or another object.

With regard to **claims 6 and 7**, Yamaguchi discloses inclination estimation means. However, Yamaguchi does not expressly disclose pitch/roll estimating means. Shimoura discloses pitch estimating means that determines pitch angle θ and roll angle α at column 27 lines 38 and 44, respectively.

Shimoura does not clearly disclose the pitch/roll angle according to the equation;

$$\tan\theta = \frac{n\sum ZiYi - \sum Zi\sum Yi}{n\sum Zi^2 - (\sum Zi)^2}$$

and roll angle α according to the equation;

$$\tan \alpha = \frac{n\sum XiYi - \sum Xi \sum Yi}{n\sum Xi^2 - (\sum Xi)^2}$$

where Xi, Yi and Zi are x-axis, y-axis and z-axis positions respectively of i-th sample and n indicates the number of samples, x-axis being the direction of breather of the vehicle, y-axis being the direction of height of the vehicle and z-axis being the direction of travel of the vehicle.

It would have been obvious matter of design choice to modify Shimoura's reference by having different parameters representing the x, y, and z-axis to obtain the angle. Shimoura discloses the x, y and z-axis at column 26 lines 20-48. It appears that the angles are obtained in the same manner with a different form, however they both have the same functionality to obtain the pitch/roll angle.

With regards to **claim 9**, the recited features are the same as those in claim 2-3, and the arguments in paragraph 4 above as to the relevance of Yamaguchi and Shimoura are incorporated herein.

With regards to **claim 10**, Shimoura discloses the pitch/roll estimating means as explained above in claim 2. Further, Shimoura discloses sensor position estimating means for estimating deviation of the position of said one or more sensors from their specified position based on the pitch estimated by said pitch estimating means and the roll estimated by said roll estimating means; wherein the deviation of the position of said one or more sensors is determined based on moving average of the estimated pitch and the estimated roll at column 28 lines 30-35 and lines 37-42.

With regards to **claim 14**, Yamaguchi discloses judging, for each of the plurality of windows, based on the estimated inclination, whether the object is an obstacle or the road surface at column 4 lines 61-67 and at col. 7 lines 7-21; and recognizing the object based on the judgment result (column 8 lines 13-19); obtaining, when the object has been judged as an obstacle in the judging step, a relative speed and a relative distance between the vehicle and the obstacle utilizing the image (the speed and distance between the obstacle and the moving body at col. 4 lines 58-67); and Shimoura discloses sensing possible collision with the obstacle based on at least one of the relative speed and the relative distance; and performing collision avoidance action at column 35 lines 56-64.

With regards to **claim 17**, the recited features are the same as those in claims 1 and 3, and the arguments in paragraphs 3 and 4 above as to the relevance of Yamaguchi and Shimoura are incorporated herein. Note: Shimoura discloses a memory 17 as discloses in Fig. 1.

Claim 18 recites identical features as claim 14. Thus, arguments similar to that presented above for claim 1 is equally applicable to claim 18.

Conclusion

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

USPN 4,924,153 – guiding movement of an unmanned moving body

USPN 5,969,969 – vehicle driving support, which is responsive to environmental conditions

7. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Shefali D Patel whose telephone number is 703-306-4182. The examiner can normally be reached on M-F 8:30am - 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Leo H Boudreau can be reached on 703-305-4706. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-0377.

DANIEL MARIAM
PRIMARY EXAMINER

Shefali D Patel
Examiner
Art Unit 2621

November 23, 2003